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IPOMOPSIS RAMOSA (POLEMONIACEAE), A NEW SPECIES FROM SOUTHWESTERN COLORADO

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ABSTRACT

Ipomopsis ramosa Schneider & Bregar, sp. nov., is described from red sandstones, siltstones, and shales of the Permian Cutler Formation in two side canyons of the extensive Dolores River Canyon in southwest Colorado. In each side canyon, *Ipomopsis ramosa* is represented by many thousands of plants, where they grow on steep slopes in sunny meadows and open forests in moist but well-drained habitat between 8200 and 9200 feet elevation, with *Picea pungens, Pseudotsuga menziesii,* and *Populus tremuloides*. *Ipomopsis ramosa* most closely resembles *I. sancti-spiritus* and *Ipomopsis tenuituba* subsp. *tenuituba,* but *I. ramosa* is significantly different from both in morphology and geography and is justifiably considered a distinct species.

KEY WORDS: *Ipomopsis ramosa, Ipomopsis sancti-spiritus*, *Ipomopsis tenuituba*, Polemoniaceae, Colorado endemics

Biological exploration of San Juan National Forest in Montezuma County, Colorado, by Al and Betty Schneider in 2006 has brought to light a previously unknown species of *Ipomopsis*, described here as *Ipomopsis ramosa*.

Ipomopsis ramosa Schneider & Bregar, sp. nov. Figs. 1–7. **TYPE: USA. Colorado.** Montezuma Co.: San Juan National Forest, ca. 28 miles NE of the town of Dolores, T38N, R11W, Sections 4, 5, 9, and 10; from 37° 35.84'–108° 6.54' to 37° 34.70'–108° 3.49'; exposure of red sandstones, siltstones, and shales of the Permian Cutler formation, ca. 35% slope, with a SW, S, or SE orientation at 8200–9200 feet (2500–2800 meters); plants with open, erect, multiple stems and corollas heavily streaked and lightly dotted with coral pink; 29 Jun 2006, *A. Schneider 5085* with Betty Schneider (holotype: COLO isotypes: SBBG, RSA, MO, NY, RM, US, ASU, BRY, UNM, FLD). Several other unnumbered collections were sent to experts for study. Otherwise no further collections of *Ipomopsis ramosa* have been made.

Ipomopsi sancti-spiritus similis sed differt caulibus brevioribus maxime ramosis, corollis glandulosis albis corallini-striatis, aristis calycis brevioribus, et stylis longioribus. *Ipomopsi tenuitubae* subsp. *tenuitubae* similis sed differt habitu breviore plus ramoso et corollis ac stylis brevioribus.

Biennials to perennials from stout taproots to 24 cm long, with stout, sometimes branched caudices to 6 cm, up to 3 mm thick. **Stems**: erect, commonly multi-stemmed and usually multi-branched, main stems 25–44 cm tall, 3–4 mm thick, stiff, often red, branched 4–9(–13) times from base and along main stem, rarely simple, branches 1–2 mm thick, often to the height of the main stem(s), moderately villous and glandular proximally, moderately villous and increasingly glandular distally, becoming moderately villous and highly glandular. **Leaves**: basal rosette prominent, 5–9 cm

in diameter, leaves 2.5- 4.5 cm long, very sparsely villous, especially along rachis, leaf segments mucronate, withered black at anthesis; cauline leaves pinnatisect with linear lobes 2.5 cm long, proximal 3–5 cm long, reduced gradually distally; center of adaxial surfaces and center of lobes often strongly to lightly villous, margins commonly lightly glandular, sometimes also villous, both surfaces sparsely glandular, becoming strongly glandular distally. The glandularity produces a very noticeable and pleasant spicy fragrance. **Inflorescence**: occupying distal ½ to ¼ of the plant, of numerous pedicelled, open-paniculate clusters, the basic unit composed of 4–7 flowers, tending to be secund; pedicels at anthesis commonly 2–5 mm long, peduncles 20–30 mm long; each flower subtended by a single 3–4 mm, entire, linear, strongly glandular bract; bracts foliaceous, the uppermost bracts entire and linear, lower increasingly pinnatifid with linear lobes often entire, less than 2.5 cm long, often strongly glandular and lightly villous. **Calyx**: densely glandular, 6–7 mm long, tube ribs green and/or purple, membrane connecting ribs white or purple; lobes equal, green, 2–4(–6) mm long, linear-lanceolate, attenuate with a non-herbaceous spinulose tip. **Corolla**: salverform, slightly translucent allowing colors to show through; tube straight or occasionally slightly curved, 14–17 mm long [measured from base of tube to sinuses of lobes], 0.7–1 mm in diameter at base, 1.7–2 mm in diameter at orifice, moderately to heavily glandular-puberulent, heavily coral pink streaked on white background, infrequently completely coral pink, fading abruptly to all white within the calyx; lobes 8 mm long, attenuate, spreading or slightly to moderately reflexed, the adaxial surface of the lobes white with scattered coral pink dots, becoming light coral pink and coral pink dotted toward the apex; abaxial surface white with numerous wide coral pink streaks. In bud, the dorsal surface of the lobes appears orange, in contrast to the coral pink tube. From a distance the overall appearance of the corolla is salmon though close-up examination shows it to be white with coral pink streaks and dots. **Stamens**: deeply included, unequal in length, unequally inserted on the tube; free part of filaments 0.1–1 mm long; anther sac 0.7 mm long by 0.5 mm wide, basifixed, vertical in tube; anther sac on lowest stamen in tube is 5 to 7 mm above base of the tube; anther sac on highest stamen in tube is 7–10 mm above base of the tube; pollen yellow. **Carpels**: 2–3.5 mm long (excluding the stigmas), style very deeply included, stigma lobes 0.5 mm long, usually terminating below the anthers at anthesis. **Fruit**: obpyriform capsules, 3–4 mm long x 1.2 mm wide and green when corolla abscises; 5–6 mm long x 1.5 mm wide and tan at maturity. **Seeds**: 2–3 per locule, cylindric, young seeds bright green, 1 mm long x 0.3 mm wide, encased in milky, gelatinous substance; mature seeds dull green, 2+ mm long x 0.5-1 mm wide, encased in the now buff-colored, solidified gelatinous substance; seed coat mucilaginous when wet. **Chromosome number** unknown. The format of the description generally matches that of Wilken and Fletcher (1988) and Wilken and Porter (2005).

The specific epithet, "ramosa," means "many-branched" and was chosen because the branching of this species is a prominent and distinguishing visual characteristic. We suggest the common name "Coral Ipomopsis."

Within several hundred miles of the populations of the new species are four *Ipomopsis* species that superficially resemble it but that differ from it in significant morphological, geographical, and ecological characteristics.

Ipomopsis aggregata (Pursh) Grant, very common in the immediate vicinity of *I. ramosa*, is markedly different in its corolla color (usually scarlet) and in its much larger dimensions: it grows to 100 cm tall with corolla tubes to 30 mm long, styles 6–18 mm long, calyces 3–6 mm long, and capsules 8–12 mm long. Some details from Wilken and Porter (2005).

Ipomopsis arizonica (Greene) Wherry resembles *I. aggregata* in a number of its morphological features and has been considered a variety of that species by Cronquist et al. (1984) and Welsh et al. (2008). It is found 250–450 miles southwest of the Colorado canyons in which *I. ramosa* is

found and is significantly distinct from *I. ramosa* having mostly single stems, glabrous to sparingly glandular upper internode pubescence, calyx lobes 1–3 mm long, scarlet corolla, stamens attached at the same level, style length 4.5–10 mm, stigma at same level as anthers, and habitat of pinyon-juniper or scrub-oak woodland. Most details from Wilken and Fletcher (1988).

Ipomopsis tenuituba (Rydb.) V.E. Grant has its closest populations in the Abajo Mountains, Utah, 70 miles west of the *I. ramosa* populations. Its corollas are commonly satin white, salmon, lavender, or pink and it is significantly larger than *I. ramosa* in many of its dimensions. It grows to 100 cm tall with corolla tubes 25–45 mm long, throat 2–4 mm wide, anthers included to slightly exserted, stigma slightly exserted to included, styles are 16-35 mm long, and capsules 5–8 mm long. *I. tenuituba* grows on a variety of substrates in high montane meadows and open aspen and conifer forests. Some details from Wilken and Porter (2005), Wilken (1993), and Grant and Wilken 1988. (Note: a Dolores Co., Colorado, specimen identified by Moore in 1995 as *I. tenuituba* (RM 714481) was, according to Ron Hartman, misidentified. The specimen is *I. aggregata*.)

Ipomopsis sancti-spiritus Wilken & Fletcher is found 180 miles southeast of *I. ramosa* in one small, rare, and endangered population in San Miguel Co., New Mexico. It grows from 30-80 cm tall and has solitary stems. Corollas are uniformly pink to hot pink, glabrous; tubes are 15-18 mm long; calyces are green, white, and purple, 5-7 mm long; styles are 1.3-2 mm long; stamens are deeply included; capsules are 4-5 mm long. It is found from 7600 feet to 8200 feet on substrate derived from the Terrero and Espiritu Santo Formation, primarily a sandy to pebbly limestone conglomerate. Most details from Wilken and Fletcher (1988), NMRPTC (2011), and personal communications from Phil Tonne and Bob Sivinski.

Ipomopsis ramosa grows from 25–44 cm tall and commonly has multiple stems almost always with numerous branches. Corollas are white with short streaks and dots of coral pink; tubes are slightly translucent, strongly glandular, 14–17 mm long; calyces are green, white, and purple, 6–7 mm long; styles are 2.5–4 mm long; stamens are deeply included; capsules are 5–6 mm long. It occurs from 8200–9200 feet on red sandstones, siltstones, and shales of the Permian Cutler Formation.

The species most similar to *Ipomopsis ramosa* are *I. sancti-spiritus* and *I. tenuituba* subsp. *tenuituba*. The three are similar in their generally dense glandularity, open to narrow, often 1-sided inflorescences, and short-pedicelled to subsessile flowers in lateral pedunculate clusters. *I. ramosa* and *I. sancti-spiritus* are further similar in their short, pink or coral pink and white corollas, very short styles, calyx dimensions, and deeply included anthers. *Ipomopsis ramosa* and *I. tenuituba* subsp. *tenuituba* are further similar in their dense upper internode glandularity, calyx colors, dotted pattern on corolla lobes, glandularity of corolla, and shape of corolla lobes.

Differences between *Ipomopsis ramosa* and *I. sancti-spiritus* and *I. tenuituba* ssp. *tenuituba* are summarized in the following pair of couplets and in Table 1.

1. Stems commonly multiple, frequently branched, 25–44 cm tall, densely glandular and moderately villous upward; corolla tubes slightly translucent, heavily coral pink streaked, ventral surface of lobes lightly coral pink dotted, dorsal surface moderately coral pink streaked, moderately to heavily glandular, tubes 14–17 mm; style 2.5–4 mm at anthesis; stamens deeply inserted 5–10 mm above the base of the tube; filaments 0.1–1 mm long, straight; habitat over sandstones, siltstones, and shales at 8200–9200 feet ..... **Ipomopsis ramosa**

1. Stems mostly simple, occasionally branched, 30–80 cm tall, densely glandular upward; corollas uniformly pink to hot pink, glabrous, tubes 15–18 mm; style 1.3–2 mm at anthesis; stamens deeply inserted 4–6.5 mm above the base of the tube; filaments 0.4–0.6 mm long; habitat over limestone at 7600–8200 feet ..... **Ipomopsis sancti-spiritus**

1. Stems commonly multiple, frequently branched, 25–44 cm tall, not woody at base, densely glandular and moderately villous upward; calyx awn 0.2–0.3 mm long; corolla tubes slightly translucent, heavily coral pink streaked, ventral surface of lobes lightly coral pink dotted, dorsal surface moderately coral pink streaked, moderately to heavily glandular, tubes 14–17 mm, throat 1.7–2 mm wide; style 2.5–4 mm at anthesis, very deeply inserted; stamens deeply inserted 5–10 mm above the base of the tube; filaments 0.1–1 mm long, straight; habitat over sandstones, siltstones, and shales at 8200–9200 feet ..... **Ipomopsis ramosa**

1. Stems usually simple, occasionally branched, 35–100 cm tall, often woody at base, densely glandular upward; calyx awn 0.6–0.9 mm long; corolla tubes and lobes satin, commonly white, salmon, lavender, or pink, lightly to moderately glandular, ventral surface of lobes occasionally dotted, tubes 25–45 mm, throat 2–4 mm wide; style 16–35 mm at anthesis, stigma may be slightly exserted; stamens inserted to 6 mm or some or all exserted to 2 mm; filaments 1–1.5, often kinked; habitat various montane meadows and open aspen and conifer forests
..... **Ipomopsis tenuituba subsp. tenuituba**

Habitat and occurrence.

Ipomopsis ramosa is currently known exclusively from two large populations, one in its type locale, a five mile stretch of the Roaring Fork Canyon, 28 miles northeast of Dolores, and the other in a one mile stretch of Wildcat Canyon, thee miles north of the Roaring Fork — both in Montezuma Co., Colorado. The new species is represented by thousands of plants in each canyon and it is among the more abundant species in its habitat. Explorations in nearby canyons with similar Cutler Formation and similar southerly orientations have so far revealed no further populations; additional searches will be needed to determine if there are more populations of the new species on the high, steep slopes in Roaring Fork and Wildcat Canyons and if there are populations in nearby canyons.

Ipomopsis ramosa occurs most often as well separated individual plants but it does occasionally occur in small clusters. Plants most often occur on sparsely vegetated soils on steep slopes (ca. 35%) with a southwest, south, or southeast orientation. The new species grows in well drained soils and on rocky ledges derived from red sandstones, siltstones, and shales of the Permian Cutler Formation. The plants flower from early June into September. Over the extent of its habitat, *I. ramosa* is very uniform in morphology.

At the type locality *Ipomopsis ramosa* grows with the following **dominant woody plants**: *Picea pungens*, *Pseudotsuga menziesii*, *Populus tremuloides*, *Juniperus communis*, and *Rosa woodsii*. **Less common woody plants**: *Pinus flexilis*, *Quercus gambelii*, *Amelanchier alnifolia*, *Lonicera involucrata*, *Populus angustifolia*, and *Salix* spp. **Associated dominant forbs**: *Heterotheca villosa*, *Ipomopsis aggregata*, *Packera neomexicana*, *Fragaria virginiana*, *Lathyrus lanszwertii* var. *leucanthus*, *Geranium caespitosum*, *Geranium richardsonii*, *Cymopterus lemmonii*, *Penstemon strictus*, *Oenothera elata*, *Galium boreale*, *Achillea millefolium*, *Lithospermum multiflorum*, *Erigeron speciosus*, *Erigeron flagellaris*, *Potentilla pulcherrima*, *Apocynum androsaemifolium*, *Castilleja miniata*, *Oreochrysum parryi*, *Hedysarum occidentale*, *Eriogonum ovalifolium*, *Valeriana edulis*, *Viola adunca*, and various grasses.

Table 1. *Ipomopsis ramosa* compared to *Ipomopsis sancti-spiritus* and *Ipomopsis tenuituba* ssp. *tenuituba*. The most significant contrasts are in bold.

	I. ramosa	*I. sancti-spiritus*	**I. tenuituba* ssp. *tenuituba*
Location, habitat, elevation	sw Colorado; spruce, douglas fir, aspen; steep SE, S, or SW slopes; 8200–9200 feet; on red **sandstones**, siltstones, and shales of the Permian Cutler Formation	central New Mexico; ponderosa, aspen; steep, SSW-facing slopes; 7600–8200 feet; on substrate derived from the Terrero and Espiritu Santo Formation, consisting primarily of a sandy to pebbly limestone conglomerate	eastern California through Nevada and Utah to Arizona and central Colorado; meadows and open woods in the high montane aspen and conifer zone on various substrates
Variability of corolla color and morphology	**highly uniform**	relatively uniform	highly variable in color (even within a single population) and dimensions
Height of plant	**25–44 cm**	30–80 cm	35–100 cm
Branching of plant	**commonly branched** from base and/or main stem	occasionally branched from base	simple to branched
Mid-cauline leaf length	20–40 mm	18–40 mm	15–45 mm
Upper internode pubescence	densely glandular and **moderately villous**	densely glandular	usually densely glandular, can be glabrous
Lateral cymes	4–7 flowers/cyme, 3–6 cymes/lateral branch	6–11 flowers	3–5 flowers/cyme
Calyx dimensions	6–7 mm long, lobes **2–4 (–6) mm**	5–7 mm long, lobes 1–2 mm	4–6 mm long, lobes 3.5–5 mm
Calyx color	tube ribs green and/or purple, membrane connecting ribs is white or purple; lobes green	tube white ventrally, purple dorsally; lobes green	tube ribs green and purple, membrane connecting ribs is white, sometimes purple; lobes purple, green distally
Calyx awn length	**0.2–0.3 mm**	0.5–1 mm	0.6–0.9 mm
Corolla color	**corolla slightly translucent; tube heavily coral pink streaked; lobes dotted and streaked coral pink**	tube and lobes pink-to-hot pink, never dotted or streaked	corolla satin; tube white, pink, hot pink, salmon, lavender, tints of blue; lobes sometimes dotted
Corolla pubescence	moderately to heavily glandular	**glabrous**	lightly to moderately glandular
Corolla tube length	14–17 mm	15–18 mm	**25–45 mm** (re: variability of style length/anther position)

Corolla lobes	acute, 8 mm long	obtuse, 6–8 mm long	acute, **11 mm long**
Style length	**2.5–4 mm**	1.3–2 mm	16–35 mm
Stigma position at anthesis	below the anthers (reverse herkogamous)	below the anthers (reverse herkogamous)	below anthers **to slightly exserted** (approach herkogamous to reverse herkogamous)
Stamens	unequally inserted 5–10 mm above base of tube, anthers well included	unequally inserted 4–6.5 mm above base of tube, anthers included	stamens unequally inserted **within 6 mm of orifice of tube, 0–5 anthers exserted to 2 mm**
Filaments	**0.1–1 mm long, straight**	0.4–0.6 mm long	1–1.5 mm (often kinked)
Pollen	**yellow**	light yellow to bluish	white to yellow, rarely blue
Seeds	2–3 per locule, the seed casing becomes mucilaginous when wet	2–4 per locule, the seed casing becomes mucilaginous when wet	unknown

*Details about *I. tenuituba* are from a variety of sources (personal measurements of plants in the Abajo Mountains; Welsh et al. 2008; Cronquist 1984; Wilken 1993, Grant & Wilken 1988) and may not be exact for all populations of this highly variable species over its entire range.

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Figure 1. High above the Roaring Fork Creek, the road climbs 1500 feet along the canyon walls which are the type locale for *Ipomopsis ramosa*. The plant is found intermittently along the first 5 miles of the road as it climbs eastward from Colorado Highway 145.

Figure 2. Typical rocky, steep, mountainside habitat and typical spacing for *Ipomopsis ramosa* in the Roaring Fork Canyon, the type locality.

Figure 3. *Ipomopsis ramosa* grows 25–44 cm tall with multiple stems and/or branches and numerous panicles of flowers.

Figure 4. Corollas are slightly translucent; tubes are 14–17 mm long, 1 mm wide at their base inside the calyx, and 2 mm wide at the orifice where the lobes flair; tubes are heavily striped coral pink; lobes are 8 mm long, recurved, coral-pink dotted on the ventral surface, and more heavily coral-pink streaked on the dorsal surface. From a distance, the corollas appear salmon or orange, but a close-up examination shows them to be coral pink and white. The center area of the tube may appear yellow but that is due to the translucency that allows the yellow anther color to show through. Calyces are strongly multi-colored and, consistent with the rest of the plant, strongly glandular.

Figure 5. Tap roots are up to 24 cm long and are topped by a caudex (shown branched here) up to 6 cm long. Basal leaves are withered at anthesis.

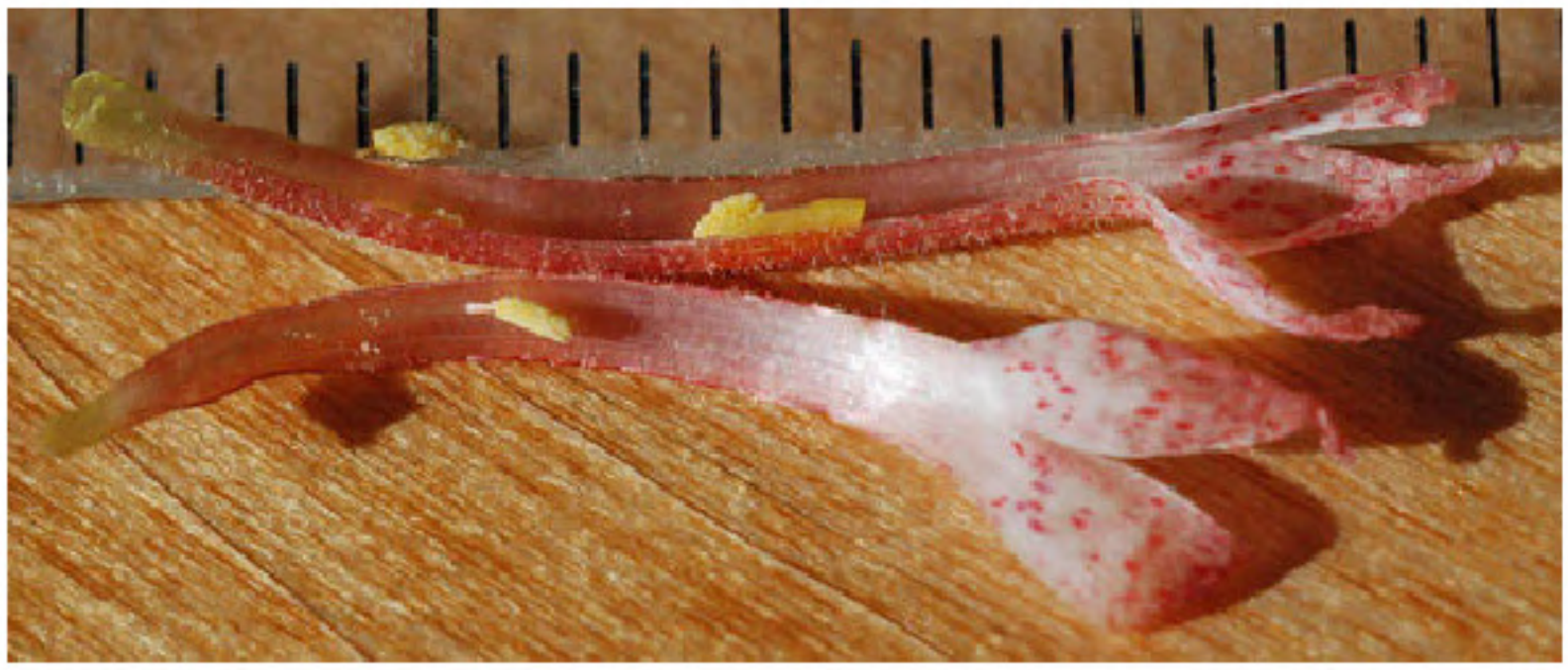

Figure 6. Stamens have very short filaments and are deeply inserted in the tube.

Figure 7. A young capsule and style. Styles grow to about 3.5 mm long and capsules to 5–6 mm long. Notice the glandularity on both the calyx lobe and the bractlike leaf.